



GE Medical Systems

Technical Publications

Direction 2190775-100

Revision 0

Stranded Steel Cable Inspection

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Operating Documentation

WARNING

- THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.
- IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.
- DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.
- FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.

AVERTISSEMENT

- CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.
- SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.
- NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.
- LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.

WARNUNG

- DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.
- FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.
- VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.
- WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.

AVISO

- ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.
- SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.
- NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.
- LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.

ATENÇÃO

- ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.
- SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.
- NÃO TENHA TENTADO REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.
- O NÃO CUMPRIMENTO DESTA AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.

AVVERTENZA

- IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.
- SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.
- SI PROCEDA ALLA MANUTENZIONE DELL'APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.
- NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL'ADDETTO ALLA MANUTENZIONE, ALL'UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.

警告

- ・ このサービスマニュアルには英語版しかありません。
- ・ GEMS以外でサービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。
- ・ このサービスマニュアルを熟読し理解せずに、装置のサービスを行わないで下さい。
- ・ この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。

注意:

- 本维修手册仅存有英文本。
- 非 GEMS 公司的维修员要求非英文本的维修手册时，客户需自行负责翻译。
- 未详细阅读和完全了解本手册之前，不得进行维修。
- 忽略本注意事项会对维修员，操作员或病人造成触电，机械伤害或其他伤害。

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IMPORTANT! . . . X-RAY PROTECTION



X-ray equipment if not properly used may cause injury. Accordingly, the instructions herein contained should be thoroughly read and understood by everyone who will use the equipment before you attempt to place this equipment in operation. The General Electric Company, Medical Systems Group, will be glad to assist and cooperate in placing this equipment in use.

Although this apparatus incorporates a high degree of protection against x-radiation other than the useful beam, no practical design of equipment can provide

complete protection. Nor can any practical design compel the operator to take adequate precautions to prevent the possibility of any persons carelessly exposing themselves or others to radiation.

It is important that everyone having anything to do with x-radiation be properly trained and fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements as published in NCRP Reports available from NCRP Publications, 7910 Woodmont Avenue, Room 1016, Bethesda, Maryland 20814, and of the International Commission

on Radiation Protection, and take adequate steps to protect against injury.

The equipment is sold with the understanding that the General Electric Company, Medical Systems Group, its agents, and representatives have no responsibility for injury or damage which may result from improper use of the equipment.

Various protective material and devices are available. It is urged that such materials or devices be used.

CAUTION: United States Federal law restricts this device to use by or on the order of a physician.

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If you have any comments, suggestions or corrections to the information in this document, please write them down, include the document title and document number, and send them to:

GENERAL ELECTRIC COMPANY MEDICAL SYSTEMS
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P.O. BOX 414
MILWAUKEE, WI 53201-0414

CERTIFIED ELECTRICAL CONTRACTOR STATEMENT



All electrical installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. In addition, electrical feeds into the Power Distribution Unit shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations, and testing

shall be performed by qualified GE Medical personnel. The products involved (and the accompanying electrical installations) are highly sophisticated, and special engineering competence is required. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE's electrical work on these products will comply with the

requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE's field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

DAMAGE IN TRANSPORTATION

All packages should be closely examined at time of delivery. If damage is apparent, have notation "**damage in shipment**" written on **all** copies of the freight or express bill **before** delivery is accepted or "signed for" by a General Electric representative or a hospital receiving agent. Whether noted or concealed, damage **MUST** be reported to the carrier **immediately**

upon discovery, or in any event, within **14** days after receipt, and the contents and containers held for inspection by the carrier. A transportation company will not pay a claim for damage if an inspection is not requested within this **14** day period.

Call Traffic and Transportation, Milwaukee, WI (414) 827-3449 /

8*285-3449 **immediately** after damage is found. At this time be ready to supply name of carrier, delivery date, consignee name, freight or express bill number, item damaged and extent of damage.

Complete instructions regarding claim procedure are found in Section "S" of the Policy & Procedure Bulletins.

6/17/94

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REVISION HISTORY

REV	DATE	REASON FOR CHANGE
0	Aug. 15, 1997	Initial Release.

LIST OF EFFECTIVE PAGES

PAGE NUMBER	REVISION NUMBER	PAGE NUMBER	REVISION NUMBER	PAGE NUMBER	REVISION NUMBER
Title Page	0				
i thru viii	0				
1 thru 6	0				
Back Page	-				

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SECTION 1

CABLE INSPECTION

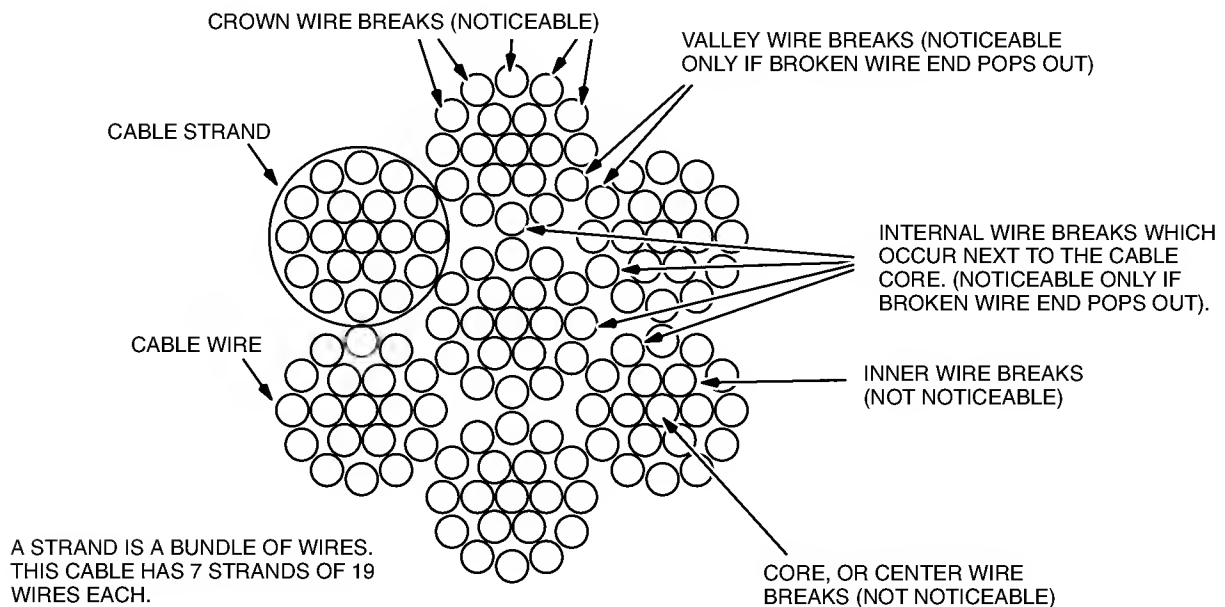
Steel cables have load carrying capabilities many times that of the loads carried. This statement is only true provided that the cable is in good condition and properly installed.

During the early period of use, a cable assembly need not be replaced if one or two broken wires is detected. However, the same number of broken wires in an old assembly should justify immediate replacement. In an older assembly, the rate of broken wires is indeterminate and maybe accelerated.

Normal use will cause slow cable deterioration. Broken wire progression is related to time and equipment usage. Normally, large numbers of broken wires do not occur in a short span of time, therefore there is a warning period between the beginning of wire breakage and complete cable failure. This is why periodic inspection is very important so that corrective action can be taken.

Refer to Illustration 1 for cable configuration and common types of cable defects.

ILLUSTRATION 1
7X19 CABLE CROSS SECTION



SECTION 2

TYPES OF CABLE FAILURE

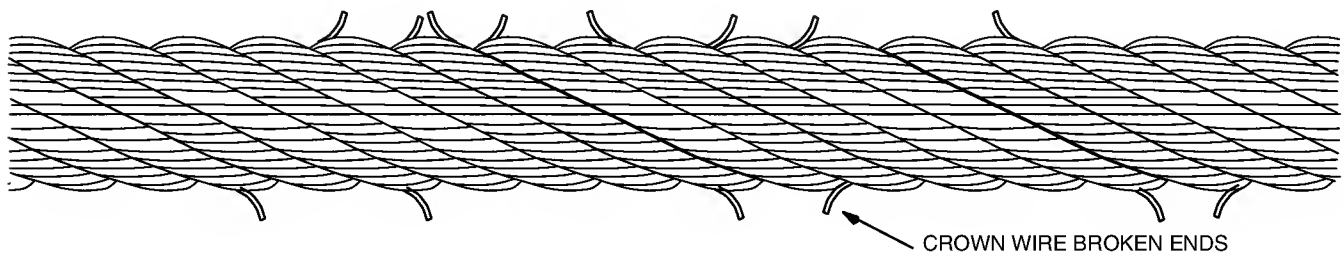
2-1 Broken Wires

Cable strength is not necessarily impaired by an occasional broken wires. However consideration should be given as to its location, length of time the assembly has been in service and the general condition of the remainder of the cable.

2-1-1 Crown Wire Breaks

Crown breaks are breaks that occur in the outer wires of the outer strands of a cable. Refer to Illustration 1. Because they are on the outer surface of the cable, they are visible upon inspection and are represented by short broken wire ends. This failure mode will generally show both broken protruding wire ends. Refer to Illustration 2.

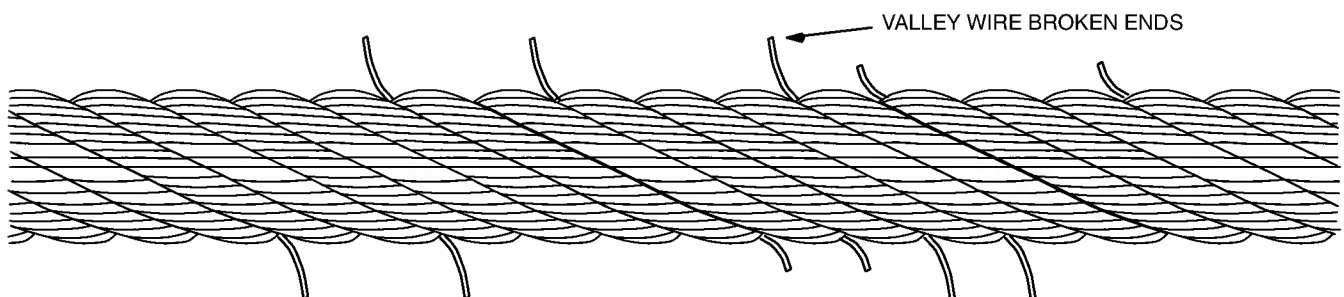
ILLUSTRATION 2
CROWN WIRE BREAKS



2-1-2 Valley Wire Breaks

Valley wire breaks occur down in the valley between two adjacent strands. Refer to Illustration 1. The protruding wire end resulting from this type of break would be longer and would stand out further from the cable than a crown wire break. Only one end, the long end of a valley wire break can usually be detected, since the other end remains buried in the valley between two adjacent strands. Refer to Illustration 3. Unfortunately, a valley wire break usually does not visibly manifest itself until quite an advanced stage of deterioration has taken place. It is also very often true that valley wire breaks may exist without having the free end spring out of place.

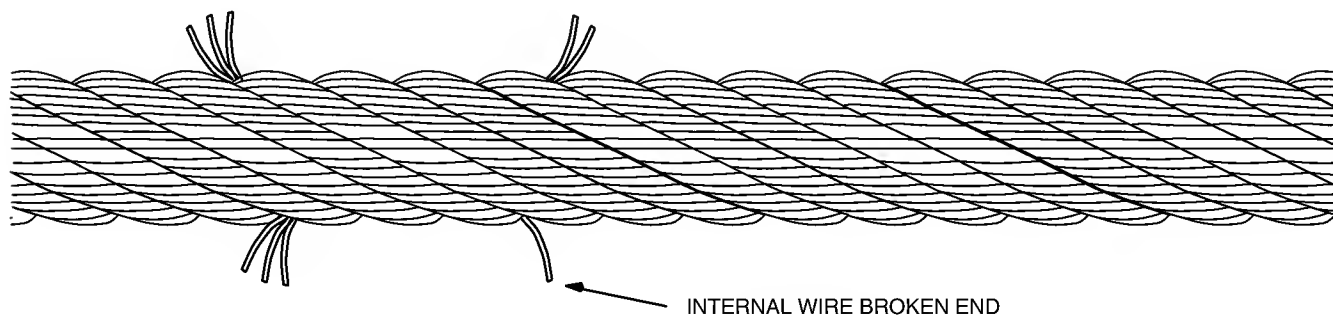
ILLUSTRATION 3
VALLEY WIRE BREAKS



2-1-3 Internal Wire Breaks

Another type of cable deterioration is the internal wire failure. This failure cannot be detected visually. This type of break takes place in the outer wires of the main strand and the outer wires of the outer strands located inside the cable. Refer to Illustration 1. It is underneath where the outer strands come in contact with the cable center member. Usually these breaks can only be detected by slackening the cable and bending it opposite to the curvature it normally assumes over the pulley sheave. This however is often most impractical to do because of inaccessibility. Here again the protruding wire end would be considerably longer than those of a crown wire break and would be even slightly longer than the protruding end of a valley wire break. Refer to Illustration 4.

ILLUSTRATION 4
INTERNAL WIRE BREAKS



SECTION 3 BASIS FOR CABLE FAILURE

3-1 Causes of Deterioration

Counterweight cables deteriorate from common causes such as abuse, wear and fatigue during normal equipment operation. All of these factors eventually result in the development of broken wires and if the broken wires accumulate in large enough numbers in localized areas, complete cable failure will result. Broken cable wires cause unbalanced cable structure resulting in unbalanced load distribution. This results in increased stress on the remaining unbroken wires.

3-1-1 PM Inspection

Although some cable deterioration cannot be detected by visual external inspection, the visible extent of cable surface deterioration can be used as a reliable basis for cable replacement. The cable should be replaced if any broken wire are caused by abuse. The cause of this cable abuse should be immediately determined and corrected.

Because of the serious consequences of possible cable failure, the field service person must be prepared to use judgment regarding cable condition and never hesitate to make a replacement. Several months or a half year's usage is small compensation if there is any danger of cable failure.

SECTION 4 FREQUENCY OF INSPECTION

This is a variable factor and often can be partially based on equipment usage. It is recommended that counterweight cables be inspected once every six months and at more frequent intervals if equipment usage warrants.

Note: It is important to note that the number of times the device is moved determines frequency of equipment usage rather than the number of patients x-rayed.

SECTION 5
INSPECTION PROCEDURE

Record inspection data. This inspection history data can be valuable in making a cable replacement determination.

WARNING

USE CARE, SHORT SHARP BROKEN WIRE ENDS CAN INFLICT PERSONAL INJURY DURING PHYSICAL CABLE INSPECTION.

Visual inspection, plus running a soft cloth over the cable's surface should be used to detect broken wires, cable abrasion and cable corrosion which are major types of cable deterioration.

Note: When inspecting a cable that disappears at one point and reappears at another, be sure to mark the cable at that point and then move the cable so that when the mark reappears no portion of the cable that passes over a pulley or that is subjected to abrasion is neglected.

External lubrication guards against corrosion and reduces abrasion. Coat soft cloth with STP lubricant and apply to the external surface during regular PM inspection.

Note: Excessive wear not only weakens the cable, but influences the development and rate of wire failure.

Close inspection should be made of cable terminations. Broken wires at cable terminals will require immediate cable replacement.

Because valley wire breaks accompany advanced stages of cable deterioration, the cable should be replaced immediately regardless of outward appearance. A cable badly affected by crown fatigue wire breaks should be replaced. Attention is called to a crown wire break as shown in Illustration 5, longer broken wire ends of both valley and internal wire breaks and also the unbalanced cable structure resulting not only from the uneven occurrence of wire failure but also from the unbalanced load distribution.

ILLUSTRATION 5
SINGLE CROWN WIRE BREAK



ILLUSTRATION 6
TWISTED WIRE SPLICE IN 1 OF 12 INNER WIRES

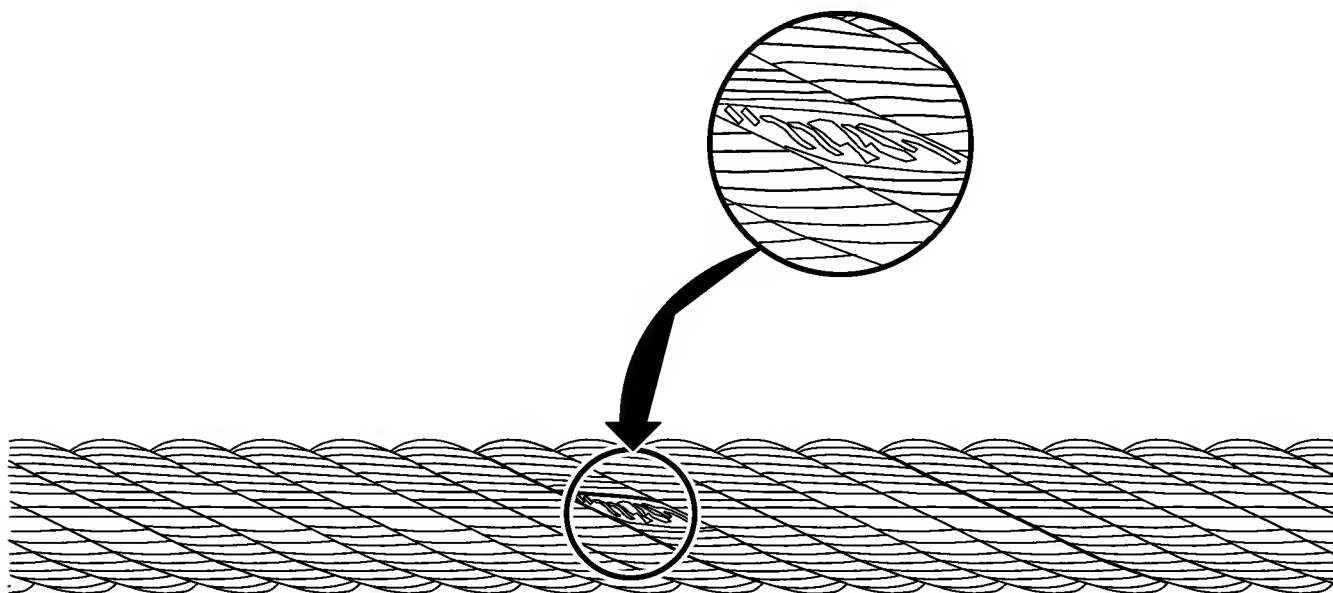
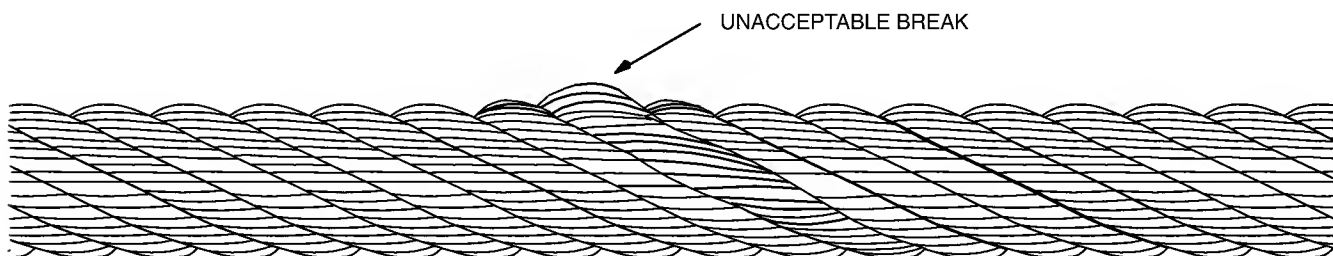


ILLUSTRATION 7
TWISTED WIRE SPLICE IN 1 OF 6 INNER WIRES





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